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REMARKS

Claims 1, 4 and 21 stand rejected under 35 U.S.C. § 102 as being anticipated by Lee et al. '604 ("Lee"), and claim 3 stands rejected under 35 U.S.C. § 103 as being unpatentable over Lee in view of Yang et al. '647. Claims 1 and 21 are independent. These rejections are respectfully traversed for the following reasons.

Each of claims 1 and 21 embody a gate insulating film having a multilayer structure including a zirconium oxide film and a high dielectric constant film including hafnium. The Examiner alleges that Lee discloses a gate insulating film composed of a combination of zirconium and hafnium. However, contrary to the Examiner's allegation, Lee discloses only a multilayer structure in which hafnium OR zirconium is used in combination with  $\text{Al}_2\text{O}_3$ . Indeed, when describing the multi-layer embodiment of the high-k dielectric layer 14, Lee expressly discloses that "the high-k dielectric layer 14 is formed by the ordered (alternate) stacking of two kinds of material layers, e.g.,  $\text{HfO}_2$  or  $\text{ZrO}_2$  layers and an  $\text{Al}_2\text{O}_3$  layer" (col. 5, lines 59-66; emphasis added). Lee goes on to emphasize the inclusion of an  $\text{Al}_2\text{O}_3$ , while suggesting just one of  $\text{HfO}_2$  or  $\text{ZrO}_2$ , as part of the high-k dielectric layer 14 (col. 6, lines 1-48).

In fact, the portion of Lee which the Examiner relies on (i.e., col. 6, lines 51-54) in the outstanding Office Action further emphasizes that "the high-k dielectric layer 14 [comprises] one or more pairs of, alternating first layer 18 formed, for example, of  $\text{HfO}_2$ ,  $\text{Ta}_2\text{O}_5$ ,  $\text{Y}_2\text{O}_3$  or  $\text{ZrO}_2$  and second layer 22 formed, for example, of  $\text{Al}_2\text{O}_3$ " (emphasis added). Lee then states (col. 8, lines 10-14):

In conclusion, by forming a multi-layered high-k dielectric layer 14, for example, comprising  $\text{HfO}_2$  ( $k=25-30$ ) or  $\text{ZrO}_2$  ( $k=20-25$ ) alternatingly stacked with  $\text{Al}_2\text{O}_3$ , the dielectric constant of the high-k dielectric layer 14 can be optimized to over  $k=20$  with a minimum net fixed charge.

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Accordingly, Lee is directed to a dielectric layer 14 which comprises HfO<sub>2</sub> OR ZrO<sub>2</sub> in combination with Al<sub>2</sub>O<sub>3</sub>. Lee does not appear to disclose or suggest a dielectric layer 14 which includes HfO<sub>2</sub> and ZrO<sub>2</sub>, nor indicate any desired need or purpose of having such a combination. Rather, Lee appears focused on including Al<sub>2</sub>O<sub>3</sub> as part of the dielectric layer 14, and then selection of *one of* HfO<sub>2</sub> OR ZrO<sub>2</sub> as part of the multi-layer dielectric 14 depending on the particular configuration of the remaining portions of the semiconductor structure (*see* col. 6, lines 1-48). Only Applicants have recognized and considered the effects that can be realized by providing a gate insulating film having a multilayer structure including a zirconium oxide film and a high dielectric constant film including hafnium, and conceived of the novel combination thereof. For example, according to one aspect of the present invention, such a configuration can prevent oxidation of a silicon substrate resulting from the oxide included in the high dielectric constant film (Lee appears to be silent as to such an effect and provides no motivation to achieve it).

As anticipation under 35 U.S.C. § 102 requires that each and every element of the claim be disclosed, either expressly or inherently (noting that "inherency may not be established by probabilities or possibilities", *Scaltech Inc. v. Retec/Tetra*, 178 F.3d 1378 (Fed. Cir. 1999)), in a single prior art reference, *Akzo N.V. v. U.S. Int'l Trade Commission*, 808 F.2d 1471 (Fed. Cir. 1986), based on the forgoing, it is submitted that Lee does not anticipate the independent claims, nor any claim dependent thereon. The Examiner is directed to MPEP § 2143.03 under the section entitled "All Claim Limitations Must Be Taught or Suggested", which sets forth the applicable standard for establishing obviousness under § 103:

To establish *prima facie* obviousness of a claimed invention, all the claim limitations must be taught or suggested by the prior art. (citing *In re Royka*, 180 USPQ 580 (CCPA 1974)).

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In the instant case, the pending rejection does not "establish *prima facie* obviousness of [the] claimed invention" as recited in claim 3 because the proposed combination fails the "all the claim limitations" standard required under § 103. It is noted that Yang et al. '647 is not relied upon to obviate the aforementioned deficiencies of Lee.

Under Federal Circuit guidelines, a dependent claim is nonobvious if the independent claim upon which it depends is allowable because all the limitations of the independent claim are contained in the dependent claims, *Hartness International Inc. v. Simplimatic Engineering Co.*, 819 F.2d at 1100, 1108 (Fed. Cir. 1987). Accordingly, as the independent claims are patentable for the reasons set forth above, it is respectfully submitted that all claims dependent thereon are also patentable. In addition, it is respectfully submitted that the dependent claims are patentable based on their own merits by adding novel and non-obvious features to the combination. For example, Lee further does not appear to disclose or suggest the positional relationships set forth in the pending claims (e.g., new claims 35-36, etc.).

Based on the foregoing, it is respectfully submitted that all pending claims are patentable over the cited prior art. Accordingly, it is respectfully requested that the rejections under 35 U.S.C. § 102/103 be withdrawn.

### CONCLUSION

Having fully and completely responded to the Office Action, Applicants submit that all of the claims are now in condition for allowance, an indication of which is respectfully solicited. If there are any outstanding issues that might be resolved by an interview or an Examiner's amendment, the Examiner is requested to call Applicants' attorney at the telephone number shown below.

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To the extent necessary, a petition for an extension of time under 37 C.F.R. 1.136 is hereby made. Please charge any shortage in fees due in connection with the filing of this paper, including extension of time fees, to Deposit Account 500417 and please credit any excess fees to such deposit account.

Respectfully submitted,

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